



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 02:42 AM UTC

PDB ID : 1MEC / pdb_00001mec
Title : CONFORMATIONAL VARIABILITY OF A PICORNAVIRUS CAPSID: PH-DEPENDENT STRUCTURAL CHANGES OF MENGO VIRUS RELATED TO ITS HOST RECEPTOR ATTACHMENT SITE AND DISASSEMBLY
Authors : Rossmann, M.G.
Deposited on : 1992-01-17
Resolution : 3.20 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtrriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

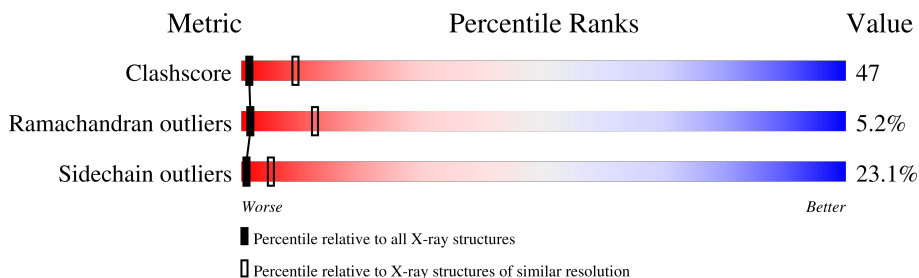
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	1573 (3.20-3.20)
Ramachandran outliers	187476	1548 (3.20-3.20)
Sidechain outliers	187428	1547 (3.20-3.20)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	1	274	29% (green), 39% (yellow), 25% (orange), 7% (red)
2	2	256	34% (green), 35% (yellow), 20% (orange), 11% (red)
3	3	231	38% (green), 37% (yellow), 22% (orange), . (red)
4	4	70	24% (green), 19% (yellow), 26% (orange), 20% (red), 11% (grey)

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
5	PO4	2	309	-	X	-	-
5	PO4	2	825	-	X	X	-

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 6710 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called MENGO VIRUS COAT PROTEIN (SUBUNIT VP1).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	1	274	2139	1375	354	403	7	0	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
1	45	ARG	ALA	conflict	UNP P12296

- Molecule 2 is a protein called MENGO VIRUS COAT PROTEIN (SUBUNIT VP2).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	2	256	2031	1279	358	388	6	0	0	0

- Molecule 3 is a protein called MENGO VIRUS COAT PROTEIN (SUBUNIT VP1).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	3	231	1773	1153	283	326	11	0	0	0

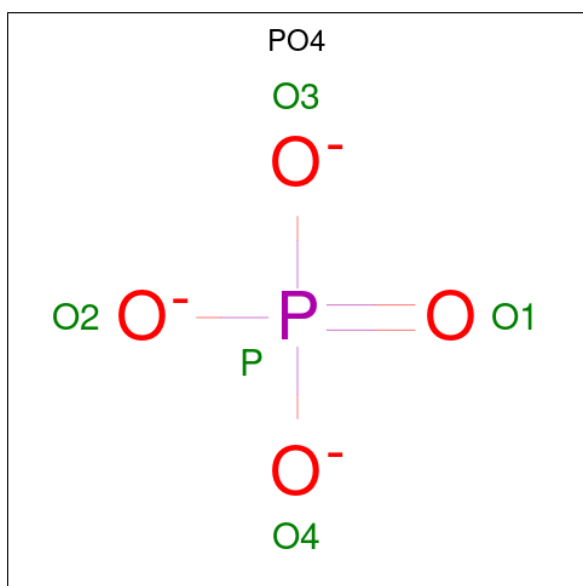
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
3	58	MET	VAL	conflict	UNP P12296

- Molecule 4 is a protein called MENGO VIRUS COAT PROTEIN (SUBUNIT VP1).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	4	62	461	284	77	99	1	0	0	0

- Molecule 5 is PHOSPHATE ION (CCD ID: PO4) (formula: O_4P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	2	1	Total	O	P	0	0
			5	4	1		
5	2	1	Total	O	P	0	0
			5	4	1		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	1	114	Total	O	0	0
			114	114		
6	2	122	Total	O	0	0
			122	122		
6	3	50	Total	O	0	0
			50	50		
6	4	10	Total	O	0	0
			10	10		

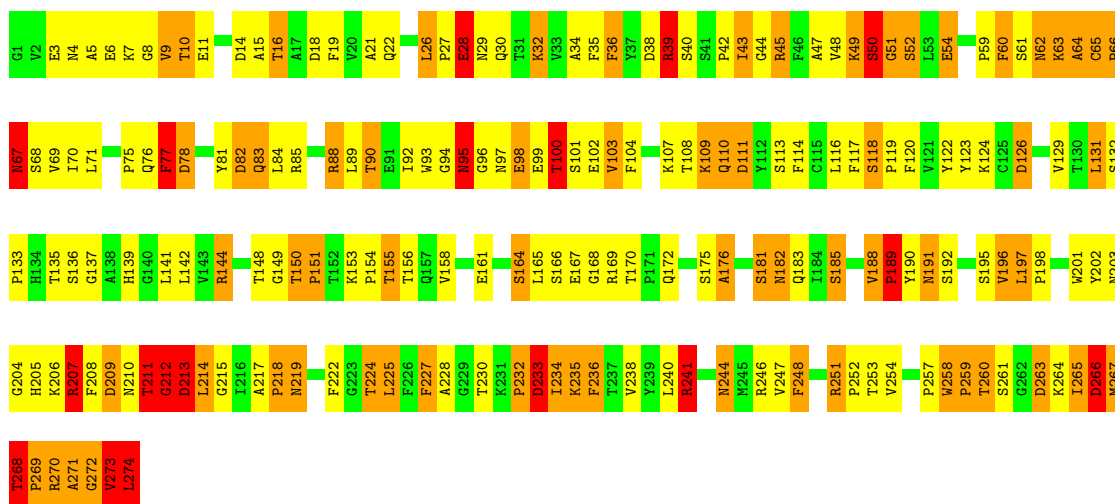
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

Note EDS was not executed.

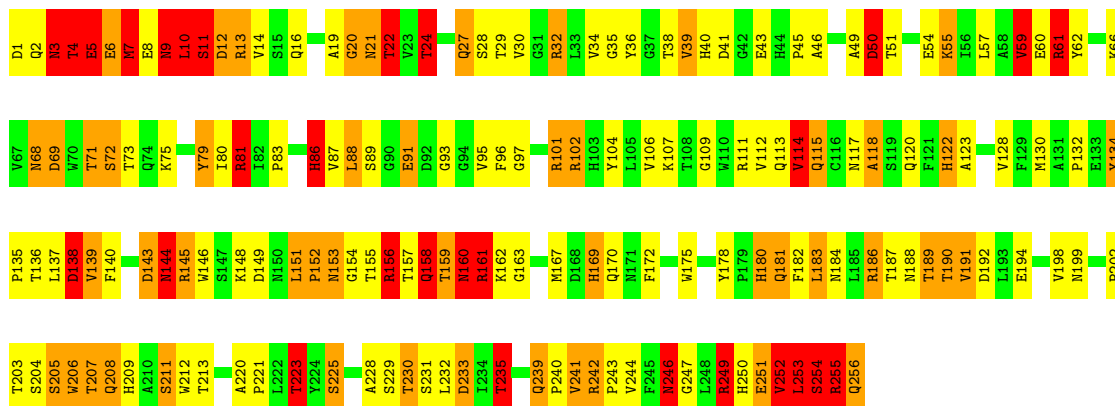
- Molecule 1: MENGO VIRUS COAT PROTEIN (SUBUNIT VP1)

Chain 1: 



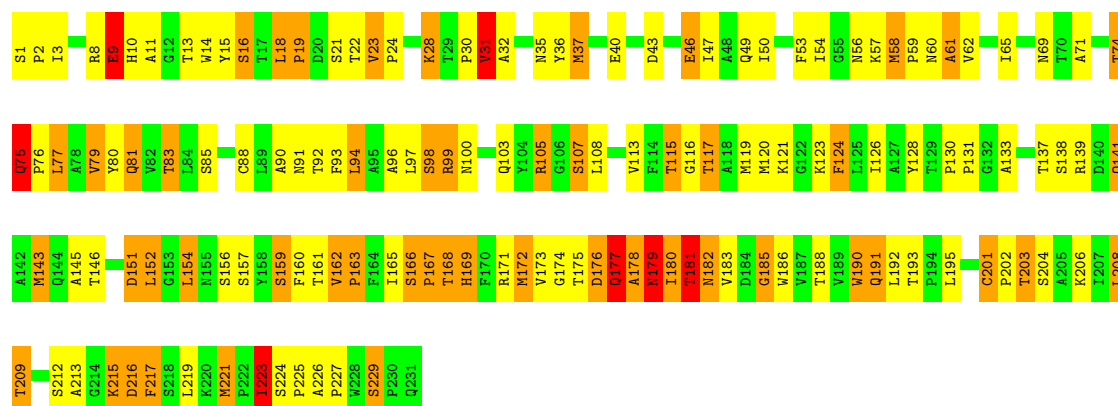
- Molecule 2: MENGO VIRUS COAT PROTEIN (SUBUNIT VP2)

Chain 2: 



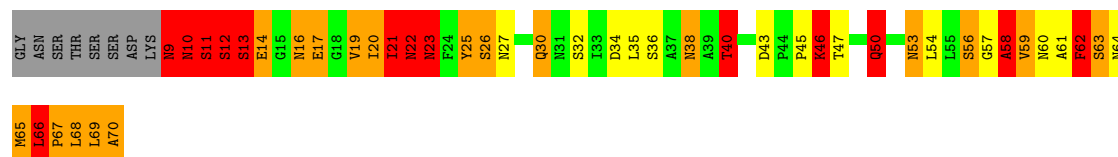
- Molecule 3: MENGO VIRUS COAT PROTEIN (SUBUNIT VP1)

Chain 3:  38% 37% 22%



• Molecule 4: MENGO VIRUS COAT PROTEIN (SUBUNIT VP1)

Chain 4:  24% 19% 26% 20% 11%



4 Data and refinement statistics

Xtrriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	439.80Å 426.90Å 421.20Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	(Not available) – 3.20	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-3.20)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	unknown	Depositor
R, R_{free}	(Not available) , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	6710	wwPDB-VP
Average B, all atoms (Å ²)	0.0	wwPDB-VP

5 Model quality i

5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: PO4

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	1	1.60	33/2208 (1.5%)	2.58	153/3018 (5.1%)
2	2	1.77	45/2086 (2.2%)	2.61	137/2854 (4.8%)
3	3	1.36	20/1830 (1.1%)	2.27	98/2512 (3.9%)
4	4	2.36	8/469 (1.7%)	4.57	37/638 (5.8%)
All	All	1.66	106/6593 (1.6%)	2.70	425/9022 (4.7%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	1	0	1
2	2	0	3
4	4	0	3
All	All	0	7

The worst 5 of 106 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	4	58	ALA	C-N	39.73	1.87	1.33
2	2	12	ASP	C-N	-27.35	0.95	1.33
3	3	186	TRP	CA-CB	-17.24	1.25	1.53
1	1	273	VAL	CA-CB	15.00	1.74	1.54
1	1	274	LEU	N-CA	14.21	1.73	1.46

The worst 5 of 425 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	4	58	ALA	O-C-N	-67.68	32.58	122.59

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	4	9	ASN	O-C-N	-52.56	38.90	123.00
4	4	12	SER	O-C-N	31.40	161.20	122.89
1	1	265	ILE	O-C-N	27.48	146.88	122.97
2	2	12	ASP	CA-C-N	21.46	162.53	121.54

There are no chirality outliers.

5 of 7 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	1	273	VAL	Peptide
2	2	12	ASP	Peptide,Mainchain
2	2	5	GLU	Peptide
4	4	11	SER	Peptide
4	4	9	ASN	Peptide,Mainchain

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	1	2139	0	2065	247	0
2	2	2031	0	1949	197	0
3	3	1773	0	1761	112	0
4	4	461	0	425	93	0
5	2	10	0	0	6	0
6	1	114	0	0	11	0
6	2	122	0	0	13	0
6	3	50	0	0	8	0
6	4	10	0	0	2	0
All	All	6710	0	6200	587	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 47.

The worst 5 of 587 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:1:273:VAL:CB	1:1:273:VAL:CA	1.74	1.62
1:1:268:THR:HG21	1:1:274:LEU:CD1	1.33	1.53
1:1:274:LEU:N	1:1:274:LEU:CA	1.73	1.50
1:1:268:THR:CG2	1:1:274:LEU:HD12	1.43	1.48
1:1:45:ARG:CZ	1:1:235:LYS:HG3	1.39	1.46

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	1	272/274 (99%)	222 (82%)	37 (14%)	13 (5%)	2	14
2	2	254/256 (99%)	214 (84%)	27 (11%)	13 (5%)	1	13
3	3	229/231 (99%)	205 (90%)	21 (9%)	3 (1%)	9	40
4	4	60/70 (86%)	39 (65%)	8 (13%)	13 (22%)	0	0
All	All	815/831 (98%)	680 (83%)	93 (11%)	42 (5%)	1	12

5 of 42 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	1	77	PHE
1	1	95	ASN
1	1	176	ALA
1	1	189	PRO
1	1	213	ASP

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	1	238/238 (100%)	191 (80%)	47 (20%)	1	8
2	2	224/224 (100%)	170 (76%)	54 (24%)	1	4
3	3	195/195 (100%)	152 (78%)	43 (22%)	1	5
4	4	52/59 (88%)	32 (62%)	20 (38%)	0	0
All	All	709/716 (99%)	545 (77%)	164 (23%)	1	5

5 of 164 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	3	107	SER
3	3	229	SER
3	3	124	PHE
3	3	177	GLN
4	4	22	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 43 such sidechains are listed below:

Mol	Chain	Res	Type
3	3	177	GLN
4	4	27	ASN
3	3	179	ASN
4	4	10	ASN
4	4	30	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

2 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	PO4	2	309	-	4,4,4	2.94	4 (100%)	6,6,6	0.31	0
5	PO4	2	825	-	4,4,4	2.93	4 (100%)	6,6,6	0.42	0

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	2	825	PO4	P-O3	-3.18	1.45	1.54
5	2	309	PO4	P-O4	-3.16	1.45	1.54
5	2	825	PO4	P-O2	-3.16	1.45	1.54
5	2	309	PO4	P-O2	-3.15	1.45	1.54
5	2	309	PO4	P-O3	-3.11	1.45	1.54

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	2	825	PO4	6	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues

The following chains have linkage breaks:

Mol	Chain	Number of breaks
2	2	2
4	4	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	4	58:ALA	C	59:VAL	N	1.87
1	2	255:ARG	C	256:GLN	N	1.16
1	2	12:ASP	C	13:ARG	N	0.95

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.